An early impingement syndrome is reversible with rest, nonsteroidal anti-inflammatory medications, and rotator cuff-strengthening exercises done with the arm at the side. In more severe, chronic cases, administering steroid into the subacromial bursa is helpful in decreasing inflammation. Overhead activities should be restricted until symptoms abate. Most patients have a favorable response to nonoperative treatment for six months, but in unusual cases with persistent shoulder pain, operative decompression is efficacious.

Last, when the shoulder impingement syndrome is manifest, it is important to look for other, often-associated disorders. Rotator cuff tear, glenohumeral instability, and generalized ligamentous laxity can be the primary problems in these patients. An accurate diagnosis and treatment aimed at the complete shoulder injury are required for a return to pain-free function.

Open acromioplasty to decompress the space between the coracoacromial arch and the humeral head has had satisfying results. Now arthroscopic subacromial decompression has been championed as an alternative to the open procedure because of decreased morbidity, full visualization of the space without detachment of the deltoid origin, an early return to normal activities, and the ease with which the operation can be done on an outpatient basis. Results compared with those of open acromioplasty have been favorable concerning the elimination of pain, the return of shoulder function, strength, and range of motion, and patients' satisfaction. This technique is generally more technically demanding than the open procedure, however, and failures have been reported, usually due to inadequate resection. For this reason, evaluating for acromial disease before the operation, adequately visualizing the subacromial space, using a precise technique, and determining the adequacy of resection are all important for a successful result.

Recent investigations have confirmed long-held suspicions concerning the importance of the coracoacromial arch. It is likely not the "appendix of the shoulder," and complete resection of the coracoacromial arch may predispose the shoulder to glenohumeral injury, such as subtle instability or rotator cuff injury. For this reason, future areas of research include examining the role of the coracoacromial arch in normal shoulder function and determining the indications and technique of partial resection.

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Anterior Cruciate Ligament Repair in Children

INCREASED PARTICIPATION by youngsters in organized sports has resulted in an increased incidence of anterior cruciate ligament injuries in skeletally immature persons. The long-term outcome of nonoperative, conservatively treated, unstable anterior cruciate ligaments in children is similar to that in adults. A large percentage will continue to have episodes of swelling, giving way, catching, and locking. This results in meniscal and cartilaginous disease.

Twisting, deceleration, contact, or noncontact injuries are common in these persons. Hemarthrosis is usually present on examination. This, coupled with a positive Lachman sign and a positive anterior drawer sign, makes the diagnosis. The Lachman test is performed by applying anterior pull to the fibia with one hand while the femur is stabilized with the other. The patient should be supine and the knee flexed at 30 degrees. The pivot shift sign may be present but is often difficult to elicit in the acute stage. Meniscal tears are commonly seen in association with anterior cruciate ligament tears, similar to the case in adults.

X-ray films are important to diagnose pull-off fractures and to evaluate the distal femoral and proximal tibial growth plates. Magnetic resonance imaging, although not necessary to diagnose an anterior cruciate tear, can be used to reveal meniscal disease in those electing a nonoperative, conservative approach. If meniscal tears are identified, a more aggressive surgical approach should be considered. Nonoperative management of these patients results in the high likelihood of subsequent bouts of giving way, catching, and locking. In patients without meniscal tears, bracing and restricting activity until the growth plate closes are an option.

Surgical treatment remains controversial. Adolescents within six months of epiphyseal closure can undergo intra-articular anterior cruciate ligament reconstruction without substantial risk of leg-length inequality or angular deformity. The younger the child, however, the greater the risks of epiphyseal complication. Intra-articular grafts, avoiding both growth plates by passing over the front of the tibia and over the top of the femur, have been described. Similarly, grafts through the central portion of the tibia to minimize tibial epiphyseal changes and then over the top of the femur have also been reported. These techniques come from large centers but with a small number of patients. Physicians who see only an occasional case might be wise to use a more conservative surgical approach or to make the appropriate referral until more information is obtained in this regard.

All agree, however, that meniscal tears in young patients should be repaired if at all possible. Meniscal repairs with extra-articular tenodesis or bracing until the epiphyses approach closure, though not optimal, are an acceptable conservative surgical approach at this time. This should be coupled with strong advice to curtail high-risk activities such as football, volleyball, and skiing until

the growth plate closes and a strong intra-articular graft can be placed.

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The Ilizarov Method

TWENTY YEARS AGO there was a resurgence throughout Europe and the United States in the use of external fixation for the management of fractures and limb deformities. Advancements in materials and techniques have reduced the soft tissue complications previously precluding the use of this method.

Simultaneously in Kurgan, in what was then the Soviet Union, G. A. Ilizarov developed his technique of distraction osteogenesis. This important advancement facilitated limb lengthening, eliminating many of the complications and decreasing the amount of surgical intervention. Ilizarov pioneered the use of a tissue-sparing, cortical osteotomy-osteoclasis technique. This technique preserves the osteogenic elements in the limb. Ilizarov advocated a delay of several days before the initiation of distraction to allow the creation of a preliminary callus that could then be lengthened. He perfected the high-frequency, small-step distraction rhythm that permitted good-quality bone to regenerate and decreased soft tissue complications such as nerve and vessel injury.

This technique produces good-quality bone formation, minimizing the prevalence of nonunion (requiring further bone grafting) or premature consolidation of the lengthened segment (requiring osteotomy and osteoclasis to be repeated). Limb-segment lengthening of as much as 140% is now not only possible, but commonplace.

As the Ilizarov methods were learned in Europe and the United States, advancements in materials and external fixator biomechanics quickly modified the technique. This expanded the indications for the treatment of congenital and acquired limb deficiencies. Different external fixation configurations, modifying the ring fixator to uniplanar and biplanar frames and adding transfixion pins and half pins to the wire fixation methods, are now standard.

Complications still interfere with the successful management of limb deficiencies. These complications are predictable enough to have changed the nomenclature in the limb-lengthening literature. Complications that can be treated and do not alter the predicted results are referred to as "problems." Only those complications that alter the predicted outcome are truly "complications." Future trends to improve the Ilizarov method will reduce the complication rate. The goals will be to prevent pin-track infection and osteomyelitis, premature or delayed consolidation of bone, angular or axial deviation of the regenerate bone, joint contracture or instability, neurovascular compromise, and psychological adjustment reactions.

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Necrotizing Soft Tissue Infections

NECROTIZING SOFT TISSUE INFECTIONS have recently received substantial publicity in the lay press. These infections present as a variety of clinical, microbiologic, and pathologic syndromes that have received a confusing array of names, including hemolytic streptococcal gangrene, postoperative bacterial synergistic gangrene, Fournier's gangrene, monomicrobial necrotizing cellulitis, nonclostridial anaerobic cellulitis, gram-negative synergistic necrotizing cellulitis, and necrotizing fasciitis.

The hallmark of all these syndromes is infection of the subcutaneous tissue and fascia that produces necrosis, with relative sparing of the muscle. Differentiating between these syndromes clinically is often impossible, and some have suggested abandoning attempts at classification and adopting a common approach to all of them.

Necrotizing soft tissue infection remains a relatively uncommon disease. Although these infections can affect any part of the body, the extremities are most commonly affected. Patients often have underlying diseases, such as diabetes mellitus, injection drug use, chronic alcohol abuse, or peripheral vascular disease. Many cases occur in the postoperative period, especially after an intra-abdominal operation.

Necrotizing soft tissue infections may be due to either a monomicrobial or a polymicrobial process. Although group A streptococci are the most common cause of a monomicrobial infection, other organisms may cause similar syndromes, including *Vibrio vulnificus*, *Clostridium perfringens*, and fungi such as *Rhizopus*, *Mucor*, and *Absidia* species. Polymicrobial infections usually involve a combination of streptococcal species, *Staphylococcus aureus*, members of the Enterobacteriaceae, and anaerobes. Because these infections spread rapidly and are devastating and life-threatening, early diagnosis and aggressive therapy are keys to successful treatment. The difficulty is that, early in their course, necrotizing infections can appear similar to nonoperative cellulitis. Thus, early diagnosis depends on a high index of suspicion for the disease. Clinical signs suggestive of a necrotizing infection include edema that extends beyond the area of skin erythema, the absence of lymphangitis or lymphadenitis, the presence of gas in the soft tissues and skin vesicles, and progression to focal ecchymoses or skin necrosis.

Once the diagnosis of a necrotizing infection is suspected, prompt and aggressive treatment is essential.